



## **NASA STTR 2010 Phase I Solicitation**

### **T10.01 Test Area Technologies**

**Lead Center: SSC**

#### **Innovative Approaches to Tank Volume Measurement**

Develop new innovative non-contact methods to measure liquid propellant tank volume and tank fluid level with improved accuracy, repeatability and minimal tank entries for maintenance and calibration. Currently, differential pressure measurements or multiple float switches are typically used. Differential pressure measurements do not provide sufficient accuracy for low density fluids such as liquid hydrogen, and multiple float switch gages only offer readings at discrete tank liquid levels, and are subject to mechanical failure and expensive maintenance. Accuracies of 0.5% or better are desired. Need for improved technology is mid-term, and highly desirable. Expected TRL at end of Phase I is 2, and at the end of Phase II is 6.

#### **Robust Components Technologies**

Develop new innovative tools to predict operational capability and life for key facility components (e.g., valves, valve seals and seats, actuators, flowmeters, tanks, etc.) for ultra high (>8000 psi) pressure, high flow rates, and cryogenic environments. Tools would be used for the design, procurement, and modification of facility components and ideally also incorporated in system models for simulation of test stand operation. Current TRL is 3 for modeling valves and flowmeters. Need for improved technologies are mid-term, and are highly desirable. Expected TRL at end of Phase I is 2, and at the end of Phase II is 5.

#### **Infrastructure Health Monitoring**

Infrastructure health monitoring and management for test facilities and for widely distributed support systems (WDSS) such as gas distribution and cooling water. Capabilities being sought for WDSS include remote monitoring of vacuum lines, gas leaks, and fire; using wireless technologies in order to eliminate running miles of power and data wires. Proposed innovative systems must lead to improved safety and reduced test costs by use of technologies for automated anomaly detection; diagnosis; determination of faults and their effects; prediction of future anomalies; capture and analysis of usage information; tools for rapid and effective analysis of data, information, and knowledge; and efficient user interfaces to enable integrated awareness of the system condition by users. Effectiveness of technologies in addressing the stated needed capabilities: robustness of wireless monitoring systems, effectiveness of anomaly detection (percent of anomalies captured, percent of false alarms), improvements in safety, and reduction in costs. Need for improved technologies is mid-term, and highly desirable. Expected TRL at end of Phase I is 3, and at the end of Phase II is 6.

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## **Cost-Saving Vacuum System Technologies**

The objective here is to prototype and field test vacuum monitoring devices that minimize "touch maintenance" thereby reducing costs and preclude cabling by working wireless. Current state of the art for vacuum jacketed liquid hydrogen (LH) lines is walking the lines and manually performing the required periodic checks and sensor maintenance. The new altitude test stand will produce high vacuum inside a large rocket engine test chamber with ambient pressure outside. Some locations will be difficult or impossible to reach. Due to the unique and harsh environmental nature of this test facility, new technologies and vacuum measurement techniques are needed to monitor this environment. Performance metrics include high accuracy and sensitivity in the 0.1 to 1 psia, insensitivity to high levels of noise and vibration, and ruggedness. Need for improved technologies is short term, and highly desirable. Expected TRL at end of Phase I is 2, and at the end of Phase II is 6.